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ABSTRACT

In this study interactive teaching of two math teachers at elementary schools in Spain was observed. Focus was on the description of the principles of the practice which guide the teaching activities of the subjects, because it was felt these principles form the base of teachers' theories with respect to the teaching and the students. During a 4-month period each teacher was observed once a week for an hour. The teachers were asked to keep a journal during the investigation. Lastly, teachers were interviewed on various occasions. The analysis of data is done by qualitative case studies. It was found that the teachers in this study used the following principles of the practice: compensation, supression of emotions, indulgence, progressive checking, authenticity, individualized attention, and intrinsic motivation. (Author/DF)

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A STUDY OF IMPLICIT THEORIES AND BELIEFS ABOUT TEACHING IN ELEMENTARY SCHOOL TEACHERS

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ABSTRACT

In this study we have studied interactive teaching of two math teachers at elementary schools in Spain. We focused on the description of the principle of the practice which guide the teaching activities of our subjects, because we believe these principles form the base of teachers' theories with respect to the teaching and the students.

During a four month period each teacher was observed once a week for an hour. We asked the teachers to keep a journal during the investigation. Lastly, the teachers we interviewed on various occasion.

The analysis of data is done by qualitative case studies. We founded that the teachers of our study used the following principles of the practice: compensation, supression of emotions, indulgence, progressive checking, authenticity, individualized attention and intrisic motivation.

1. Introduction

Investigation about teachers' thought has taken different patterns in relation to the problems investigated and the methods of investigation used. Clark and Peterson (1986) have recently revised the state of investigation in this field, classifying the study of teachers' thoughts into three topics: planning, interactive teaching, and teachers' theories and beliefs. In respect to the latter, it has been affirmed that "research on teachers' implicit theories constitutes the smallest and youngest part of the literature of research on teacher thinking" (p. 281).

Subjective or implicit theories influence and determine teacher behavior in such a way that, as shown by Mandl and Huber, "the experiential component of these subjectives theories influence the interactions between the teachers and their students; teachers rely on this knowledge when they try to explain or predict student behavior and when they select their own behavioral strategies" (1982,p.5). Implicit theories conform a measure of inner reference which the teacher utilizes to conceptually structure his/her life and teaching activity.

Argyris, Putnam and Smith (1985) established that the persons who act construct a simplified representation of the reality in which they act: "agents learn a repertoire of concepts, schemas and strategies, and they learn programs for drawing from their repertoire to design representations and actions for unique situations. We speak of such design programs as theories of action" (pp. 81-82). The theories of action can also be espoused (the subject is conscious of them) but also they can be theories-in-use or implicit theories.

Investigation about teachers' implicit theories proposes "to make explicit and visible the frame of reference through which individual teachers perceive and process information" (Clark and Peterson, 1986, p. 287). Implicit theories takes the form of a hierarchically structured set of beliefs about the proper ends and means of teaching, the characteristics of students, the modes of learning, and the way in which all of these interact to govern the teacher's behavior at any given moment. This implicit theory enables the teacher to cope with the otherwise overhelming abundance of problematic situations or occasions for decision making that confront a teacher moment by moment during a school day (Gage, 1979, p. 80).

Marland (1977) analyzed the implicit theories of six teachers, focusing the study on the principles of practice. The principles found were the following: compensation (the tendency

teachers have to help and dedicate the majority of attention to introverted students or those with less skill); strategic leniency (described as the tendency of teachers to ignore discipline problems of those students who need some type of special attention); power sharing (whereby the teachers award responsibility to good students); progressive checking (here, the teachers verify students' progress by knowing which problems they are going to be finding, and finally surpressing emotions (a tendency of the teachers not to show their feelings in class. Marland's findings apply for analyzing the teachers' principles in our study.

Another study carried out by Conners (1978) repeated Marland's work, finding three significant principles, one which coincided with those identified by Marland. These principles were: suppressing emotions, teacher authenticity and self monitoring. The first of these principles coincide with one Marland found. The principle of teacher authenticity is one teachers use to present themselves to students as honest, confident, open and sincere. Finally, this principle of self monitoring refers to the necessity the teacher has to control his/her efficacy and the effect these can have on the students.

Teacher's educational beliefs are another topic which have been investigated as part of the study of implicit theories. Bauch (1984) elaborated the "Teacher Belief Inventory" to investigate the beliefs of elementary school teachers. She also maintained interviews and observations from a reduced sample number of teachers. The discriminant and correlation analysis permitted the identification of two types of teachers: teachers with "controling" beliefs which offered the students an almost exclusive socialization curriculum, and teachers with "relative" beliefs which reach beyond socialization and include activities directed towards educational ends.

Tabachnick and Zeichner investigated student teachers' beliefs and their relation to these students' teacher behavior. Using observations, interviews and anlysis of materials Tabachnick and Zeichner investigated the evolution that teachers' beliefs undergo as a consequence of putting their beliefs into practice. Two teachers who formed part of this study showed conflicts between their beliefs and their behavior in class, in such a way that their teaching conduct did not correspond with their beliefs, or viceversa. The strategy employed by both teachers to overcome these differences varied in each case. The first teacher altered her beliefs to justify her conduct in class, while the second changed her teaching conduct to adapt to her beliefs. Both strategies are different but they commonly share the intention to find and re-establish the lost balance between belief and conduct. As a consequence, Tabachnick and Zeichner conclude that "in both cases the move to greater consistency between belief and behavior was the

result of a negociated and interactive process between individuals and organizational constraints and encouragements" (1986, p. 95).

In the area of teaching mathematics, Ferrini-Mundy (1986) examines the relationships among math teachers professional and educational background with respect to the following attitude and beliefs: attitude about mathematics, beliefs about the teaching and learning, conceptions of mathematics as a discipline and beliefs about mathematics students. The subject of their investigation was a group of 39 teachers who participated in a summer master's program in mathematics. The author did not find correlation between the different beliefs and studies attitudes. In this way, it found significant differences between math and other subject-matter teachers in five of the 60 items of the survey instruments.

Leinhardt and her colleagues at the University of Pittsburgh have realized investigations about the teaching of math by expert and novice teachers. The teaching of math has three fundamental levels: time and coverage; lessons, and the content. Routine is one of the most important elements in the interactive teaching of math: "A routine is a cooperative little script of behavior that permits teachers and students to meet shared goals such as passing out papers, doing problems at the board, responding in unison or individually, or asking questions. Routines are the glue of a lesson. Without them, task take too long and teachers and students work at cross-purposes" (Leinhardt, 1986, p.30).

In the following study we present, we have studied interactive teaching of two math teachers at elementary schools. We focused on the description of the principles which guide the teaching activities of our subjects, because we believe these principles form the base of teachers' theories with respect to the teaching and the students.

2. Methodology of the research

2.1. Subjects

The subjects of our research were two elementary school teachers; one taught sixth grade and the other seventh. Both taught the same subject: mathematics. These teachers worked in private schools in Granada.

2.2. Method

The technique of research applied in this investigation was a case study of each teacher selected 1)because each teach in a private institution, 2) both teach at an elementary academic level, and 3) they teach the same subject matter.

During a four month period each teacher was observed once a week for an hour and a half. These observations were realized without any type of audio or video equipment; during class the observer made notes on the teachers' conduction of the class. These observations helped to orient the questions the teachers were asked later.

We asked the participants to keep a journal during the investigation. In the journal they were to note reactions, reflexions or preoccupations they experienced in relation to their classroom instruction. The use of the diary as a technique for collect information commonly comes from investigations about teachers' thoughts (Yinger and Clark, 1985).

The teachers were interviewed on various occasions, some recorded and some not. The data collected from the journals and observations was analyzed during the interviews.

3. Case One

3.1. Introduction

María is a thirty four year old teacher who works in a private school in Granada. She has twelve years of teaching experience at the same school. She teaches mathematics and natural sciences in sixth and seventh grades.

The school where María teaches is a private religious school which only admits girls. The school halls are very wide, and decorated with posters which allude to religious subjects. The class in which we observed María is seventh grade, and is located in the basement of one of the school buildings. Thirty two individual desks and their corresponding chairs occupy the classroom as well as the teacher's desk. The walls are decorated with drawings and posters; beside the blackboard there is a crucifix and a picture of the Pope.

This school year María is teaching mathematics. During the observation period, which ran from the beginning of January through the end of April in 1986, the teacher covered the following

material: equations, representation of functions on coordinate axis, problem solving with equations, proportions and geometry.

3.2. Analysis of beliefs and principles of Case One

INTERACTIVE TEACHING. PROBLEM SOLVING IN MATHEMATICS

Based on the observations María's class sequence has a structure that repeats in a perceptible form. In this sequence there are three elements which play an important role: the activities students perform in class, the "explanations" of the teacher and the corrections of the exercises the teacher gives the students. These three elements combine in different forms in such a way that Maria dedicates all of the class time to corrections, while in another she introduces a teacher "explanation", followed by class exercises.

María confirmed, in an interview that her classroom routine consisted of the following elements:

- Correction of problems from the day before
- Explanation of a new topic
- Students' questions
- Class activities and/or explanations of the new topic.

This sequence of correction-explanation-exercises is not casual. The teacher express her beliefs in its value:

> "I have not found another system to explain math, which is a subject that is not borrowed from any another one".

Maria's explanations never last more than a half an hour so that she is always able to complete it with exercises. On other occasions, entire classes were dedicated to corrections of the work assigned the day before, she says:

> "...we begin class, which usually flows without a problem, solving all of the problems from the previous day's work on the board".

María introduces or explains new content usually by a verbal presentation which frequently is uninterrpted by the students, unless one of them asks a clarification of some concept. After María has introduced the material, she solicits questions and follows with examples.

The CORRECTION of the students' homework María assigns is a routine points made at the beginning of class. Corrections are done in groups or individually. When completed as a group,

corrections are oral (the students respond either in unison or individually) or on the board.

The exercises which from María's point of view that not present great difficulty are reviewd orally, as she directs:

> "Next we will correct the items relation to unit 8 (..) We will correct them orally since they are not too difficult".
> And/or:
> "We will correct some exercises orally, because they have only one specific answer. The problems which are somewhat more difficult we will put on the board".

The teacher always makes the decision to go over the exercises orally or on the board, thus she is the one who decides if the work done orally should be later repeated on the blackboard. In these cases the teacher determines whether or not the work should be displayed on the board based on the class' oral response:

> "...if they have completed the problems beforehand and the operation is long I ask for the response, and if they all more or less answer correctly, I continue and if not I demonstrate the answer on the board".

Oral corection of the exercises generally consists of the teacher asking for the answers, and the students give the result verbally. When oral correction provokes some type of problem, the teacher intervenes:

> "During the correction there has not been any type of problem I had to call their attention due to their behavior, because all of them wanted to answer at the same time. So I opted to read out the answers myself".

The exercises that are done on the board are expressed in their totality, which resolves from the solution of the problem. The problems solved on the board follow an established routine. Generally, the teacher asks for volunteers to go to the board; she decides who goes to the board affirming she:

> "...sends whom it is necessary to send".

Following this, María reads out the problem once or twice. As a student works a problem out on the board, the teacher simultaneously explains how to olve it to the class. When a student goes to the board who does not know how to solve a particular problem, María generally asks the others students for solutions; if

no one can answer, María explains the problem on the board. She also gives the answer if there is not enough time for the student to solve the problem on the board:

> "Antonio wants to be one to work the problem on the board, but as there is little time left, I have decided to do it".

When a number of students volunteer to give the answeer to the problem, María generally decides to give the answer herself, emphasizing this as a means of class control when she states:

> "During the correction, there were not any problems, but I had to call the class down due to the fact that so many wanted to give the solution at the same time, I opted for giving the answers myself".

The realization of exercises is, as we can compare the most important activity for the teacher. Explanations should be reinforced with exercises and problems, only in this way can students comprehend the content:

> "We will continue to dictate some problems about equations, which will be too few until we all are able to understand them".

THE STUDENTS

References to her students is one of the constants to be noted during the observations of María's classes, as well as in the analysis of her journal and interviews. The students are on the teacher's mind with respect to disciplinary aspects, motivation, accomplishement and comprehension, which María terms as "thinking and reasoning".

a) Thinking and reasoning

Learning to think and reason is one of he objectives of teaching mathematics. This is one of María's beliefs, who thinks that her students, in general do not suitably reason:

> "...it is that they are not accustommed to think, to reason in a logical way..."

For the teacher, teaching how to think and to reason is not exclusively her responsibility. She thinks that it is something her students should have already learned how to do. The following dialogue documents this belief:

Teacher: "The problem is that, except for two or three students, you do not want to think through a problem".

Student: "Miss, and if we don't know to think through a problem logically...?

Teacher: "It isn't difficult, and it takes work, but it is late to begin now".

Teacher: "We have been doing problems for three months. If you do not begin to reason logically, I can not teach you how to work mentally through the problems. That is a skill each of you must continue to acquire"

b) Compensation

The management of class participation resolves around the teacher, María, who decides either who goes to the board or which student responds from her desk. In this way, it is María who gives the answers to the problems when she believes it opportune. However, the regulation of class participation does not correspond to some unknown law. Such as Marland demonstrated (1977), the principle of Compensation "represents an attempt on the part of the teacher to discriminate between the timid, the introverted, the less skilled and/or the culturally disadvantaged" (Clark and Yinger, 1979, p. 253). This principle also is present in the study of our teacher when she affirms:

> "I try to ask questions; normally I ask those which I believe have more difficulty, right?... not those who are more easily distracted or those for whom it takes more effort. I also question those who keep up with the normal pace of the class, but I pay less attention to them than I do to those who are behind".

c) Students seatings

The students in Maria's class have assigned seats. It is the teacher who decides where the students sit and when changes are made. Each month routinely brings about a change in the seats, in a way that those who sat up front one month are assigned to the back another month, and viceversa. María wrote in her journal:

> "Upon entering class, the girls had been arranged differently.. the ones at the back, which have been less controlled and are less known, have been moved to the front, and those in the front are in the back".

In this way, the seating change represents a behavior control method for the teacher. The distance between each student's desk in relation to the teacher's desk confirms a direct proportional relationship to the teacher's control over the students. This factor is proved when María records in her journal:

> "It is neccesary to change this girl to another seat because at the back of the class it is not easy to control her".

The students in María's class are seatled in pairs.In this manner, the pairing also influences the achievement of the students, according to the teacher of our study:

> "These girls' attention and achievement have decreased since they have been seated together at the back. I belive it would be convenient to separate them..."

4. Case Two

4.1. Introduction

Carmen is a 35 year old teacher with 13 years teaching experience. She has participated in teacher improvement workshops and has completed three years of theology. The school where she has been contracted for seven years is a cooperative private school. The school is located in a lower class neighborhood in Granada. There are preschool, elementary and special education classes .

The class in which we observed Carmen was sixth grade, where she teaches both math and religion. The group of students is numerous: 49. The group is basically heterogeneus formed by advanced, repeating and another group of students integrated in the class which form part of the "Aulas Integradas"*

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* The "Aulas Integradas" is a Spanish Special Education Group which streamlines borderlines especial education students into the normal classroom.

The math class taught by Carmen is held in an assembly hall on the first floor, which is also used as a library during others hours. In spite of the dimension of the hall, there is not much space; six aisle of ten arm seats for writing occupy the entire hall. A television, a fan, and a ideological school poster are the only decoration.

4.2. Analysis of beliefs and principles of Case Two

INTERACTIVE TEACHING. PROBLEM SOLVING IN MATHEMATICS

Carmen's math class includes a conjunction of activities which are systematically repeted, although they do not always occur in the same order. These activities are: introduction and explanation given by the teacher of content and problem solving either on the board or individually. The teacher try to vary the sequence of the class to avoid monotony for the student. She says:

> "To avoid the monotony of correcting homework, I occasionally change the activity. Sometimes I ask them to study a concept on a certain page of their book and invent an appropiate exercise themselves to practice what we have seen; or sometimes I tell them to note the difficulties they observe in what we have just done".

In the presentation or introduction of each new content, Carmen begins by inquiring and asking what the students might know about the same. Reference to real life situations is one recourse the teacher utilizes to give "meaning" to mathematical concepts. During the discussion she makes them see that the concepts to be studied have "something to do" with their everyday lives. She wrote in her journal:

> "Today we began our lesson with a study published in a newspaper about Granada's family incomes. I took special note of this order to call the attention of the students to percentage problems".
>
> or
>
> "We are beginning a new lesson on longitude measurement. For this, we have begun by discussing about their experiences with measurement".

The invention of exercises or problems by the students plays an important role in Carmen's class because it is her way of

knowing if the students have understood a particular concept. In the same manner, the invention of problems provides a way to motivate the students with an activity they enjoy. She observes:

> "Some are so motivated that it seems to be less than enough work; they want more. Better than anything they like inventing and solving problems that other students have elaborated".
>
> "To know whether or not they have attained the concept of X per one hundred, I ask students to pose questions to each other"

GROUPING

Carmen's class, as we have noted earlier is very numerous: there are 49 students of different levels and capacities. Carmen has the class divided into three groups: one group, with the few students of higher ability, an intermediate group comprising the majority of students, and one group of low level students. This student "grouping" is not reflected in the spatial distribution of the children in the class, who all freely select where they sit. The existence of these distinct levels of competence between students obligates Carmen to carry various work paces, including individual rhythms, for distinct types of students. Thus, one homework assignment or activity can be realized with greater ease by one group of students, but for another group -namely the lowest level- it would be excessively elevated. Carmen wrote in her journal about this question:

> "There is one group who has one type of activities while for others I suggest they do exercises directed toward achieving minimal objectives".
>
> "Today we dedicated the class to reviewing exercises for the most numerous group in the class, the advanced and the intermedient student, while the slowest paced and farthest behind worked quietly on their assigment. No special seating arangements are made for these groups, they are all mixed together".
>
> "As we continue with new content more difficulties are detected because there are students who are not following the general rhythm. Up until now the lesson we are studying was covered in fifth grade, because almost everyone could do it well. Now I

will have to design a different program for those who have still not mastered the basic operations".

Having students of various levels can become a problem when some students finish their classwork at different times. Carmen "controls" possible distraction by designating a time limit for the completion of a problem or assignment:

> "Some wish to work together, which I permit them to do because almost all of them take it seriously. Some take advantage in order not to work, which clearly in this case I give them a determined amount of time, that obligate the to work harder"

HOMEWORK ASSIGNMENTS AND THE RHYTHM OF THE STUDENTS

Carmen organizes each student's work at different competence levels by preparation and assignment of differentiate homework on work cards for each student of the distinct groups. For example, when she write:

> "I prepare special work for Antonio, Juan y José as they will have assimilated this material, they can work on other assignments, because if I don't, they become bored and lose motivation".

> "I prepare a special rhythm of personal assignments for Antonio, and Rafael so that they advance in the material that they are behind in".

The work rhythm realized by each student is established by the teacher as well as the student. Carmen insists in her class that each person should keep a record of the problems thay have the most difficulty with, so that the students themselves may solicit extra classwork, in order to master that particular content. Carmen says in one journal the following statement:

> "I frequently insist that the students keep a record of their activities, taking notes and indicating those exercise where they have difficulty".

Carmen alows her students the freedom to mark their own workpace; they themselves select the number and type of mathematical problems they want to solve; in this way each can establish his/her own rhythm. For example, she directs:

> "They can skip a certain number of activities and/or work more in other. They have the freedom to

fix the work to be completed each day. They cover the content in a much shorter time span than it would take me to determine for them".

PRINCIPLES IN PRACTICE

Through analysis of the journals, interviews and observations of Carmen's classes, we are able to identify certain "principles in practice" of Carmen. In general, these principles coincide with those that Marland (1977) and Coners (1978) identified. They represent the teacher behavior and thought schemes which guide the teacher's practice of teaching in proportion to a certain rationality and normality. The principles that we have identify are the following:

a) Compensation

The compensation principle refers to the teacher's tendency to help and dedicate more attention to those students whom need some special attention. This principle is perceived in Carmen's class, as can be noted in her journal:

> "...especially, those whom I see as more problematic, I make an effort to be near them, or know how they will react".

> "My intention today is to motivate everyone, but especially those which for one reason or another are behind".

b) Supression of emotions

The teachers studied by Marland and Conners showed a tendency not to present or make public their emotions or sentiments in class. Carmen likewise assumes this principle so that she presents herself to her students as a balanced person, someone who does not undergo mood changes:

> "I try to maintain the same equilibrium always, even though something might preoccupy me or if I haven't slept well. Yes, I strive to maintain the same equilibrium; in other words, that the children one day don't see me as exhuberant, and another day disheartened. I think it is important that they always see me as the same".

c) Indulgence

A third principle in practice by the teachers is indulgence. This refers to the tendency they have to ignore discipline problem created by students who need some type of special attention. Carmen also applies this principle in her teaching practice, in a way that on occasion she does not call attention to the students behavior if they have special problem, or because she understands to do so could create even greater problems. We have founded this principle, for exemple in the next statement:

> "There are times I see them and let them get away with it. It depends, because there are times when I realize that if I call them down it will cause a greater problem because I know there has been some type of conflict".

d) Progressive checking

The teachers verify the student's progress by knowing the problems which they may find and in this way they needs of each student. The teacher of our study employed this principle with marked seriousness. She records the progress of each students noting the tests results, personal work completed and class participation. Specifically, she said:

> "I have a personal index card divided into three parts: one refers to the quizzes we complete as a class, another on which I make notes about their class participation, and another which more or less indicated their effort.I normally do this about every three lessons, depending upon the difficulty they may have. I call them up one by one to my desk, they show me their notebooks and I see what they have completed".

e) Authenticity

Teachers, according to a study by Conners, attempt to present themselves to their students as someone whom they can confide in, someone who will help them learn, and some who maintains pleasantness in the class and good relations with each of them. The teachers are friends before they are authority figures. This is the concept that Carmen has as her role as teacher. She affirms that:

> "Once I get to know them (the students) I try to put myself by their side. in some manner, when speaking with them I try to make them see I am

interested in them, that I'm not against them, but that if they do a little work I will bear if in mind more than any other things..."

f) Individualized Attention

One of Carmen's practical principles includes individualized attention of the students. We can observe through this principle that the teacher of our study at all times strives to know her students: their personality, their favorite games or sports etc. This serves to make the students realize that she does not ignore them as individuals. She verifies this when she comments:

> "...for more than any other reason, I do it so that they do not pass unnoticed; so they know that I am very aware of them, that I realize their activities, what they do, how they move...".

The individualized attention principle derives from the type of reinforcement that the teacher supplies to each student be distinct. For example one day she brought stamped pictures to school to exchange with a student who collects them. For the teacher, individualizing also motivates each student to be him or herself. She observes:

> "Books bore Antonio, but it is not difficult to motivate him. It is enough for him to know that I need his service or assistance. In this way he feels confortable and works".

g) Intrinsic motivation

One final principle we have identified in the teacher of our study is her tendency to try to motivate students by correcting math exercises. In this way, she assigns each student problems at the level of difficulty which they are capable of completing. More specifically, she makes the students complete relatively easy problems so that they will do them well, and thus be motivated to try other more complicated ones. She affirms that:

> ""I make the most of the fact that Rafael has worked diligently on his exercises which I know he can do to stimulate him"

> "Pedro went to the board to explain a problem. I will take his efforts into account and invite him to go other times, procuring that he does problems which I know that he understand well"

5. Discussion

The two cases described above correspond to two teachers who teach the same subject-matter, at the same level, and at the same type of private school. However, the description of both cases shows that there exist differences between the beliefs and theories of both teachers. We agree with Feiman and Floden when they affirm that there are not a unique "culture of teaching" (Feiman-Nemser and Floden, 1986).

The analysis of the observations, journals and interviews demonstrate that the teacher in the first case -María- holds a conception of teaching mathematics centered on the material, on the content, as she teaches. Her classes have a structure which systematically repeats itself, and whose objective is the student to obtain mathematical concepts and master the skill of reasoning logically. She achieves this by having the students resolve their problems, whose correction acquire routine as established by Leinhardt (1986).

The control and management of the claas revolve around María; she is the one with "power" to direct discussions, correct the students, decide upon the rhythm of teaching, etc. The flow of communication in María's class is unidirectional, in a way in which all communications goes through the teacher.

On the contrary, Carmen conceives teaching mathematics as a measure "centered on the students". The attention given to the students, as it appears in Figure 1, demonstrates this both in her instructional strategy as well as in the management and evaluation of the students.In spite of the elevated number of students in Carmen's class -49- she takes the time to know what the student know about the content to be taught, in such a way that it will be more "significant". In this way, Carmen groups her students into three levels according to their capabilities, which determines that the rhythm of teaching will not be homogeneous for all of the students.

Students grouping is a variable which is not present in María's class, whose students all follow the same rhythm, and thus share the same level of learning. María assumes that the teacher has the responsibility to make the students learn. This responsibility determines, according to her own belief, that she also assumes all the authority in the class. What's more, this authority is explicit and patent in the observation of her class, the students pay attention and know that it is the teacher who gives the world for intervention; she dictates the problems and exercises; she is the one who determines the rhythm of teaching; she evaluates; she decides where the students sit, etc.

FIGURE 1

MARIA	CARMEN
Focuses on the content	Focuses on the students
Only one class rhythm exists which is decided by the teacher	Various learning rhythms according to grouping
The class is as one unique group	The class is divided into three levels according to capability
Class control and management are explicit	Class control and management are implicit
The teacher assigns seats	The students choose their seats
Evaluation is summative, according to tests and done by the teacher	Evaluation is formative; progress is checked progressively, and the students can evaluate themselves
32 students in class	49 students in class

The authority in Carmen's class is apparently more diffuse. She permits each student to decide his/her own rhythm of learning, so that each controls his/her own achievement.

We can thus observe two styles of teaching which derive from two theories or conceptions about teaching. These theories, inwhich neither of the teachers manifest in an explicit form, can be deduced from observation as in the analysis of the teachers' reflections. These theories conform to the beliefs the teachers have towards the content, the students, the class rhythm, management, and evaluation..

Carmen's principle in practice demonstrate a greater preocupation for the students, in the sense that she thinks of them as more than just students, as persons. Aside from the principle identified by Marland (1977) and Conners (1978) we have identified two of Carmen's principles, which are personalization and intrinsic motivation. Both principles confirm our affirmation in respect to

the implicit theories of this teacher has towards in students in a great measure. The personalization principle is nothing more but a need the teacher perceives as to know each of her students individually. Once she achieve this, she treats each one individually as she knows what weak points each one has; in other words, how she can motivate them. In some cases it is a game, a sport, books, etc. That information is used by the teacher to implicate each student in the teaching of mathematics.

A second principle we have identified in Carmen is intrinsic motivation. Through this principle we observe the tendency of the teacher to propose each of the students solve problems according to the difficulty each thinks he is capable of completing. In this way, correct completion of an exercise or problem functions as an element of motivation for student.

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